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EXAMINER	
MEHTA,A	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/331,723	Applicant(s) BOYNTON ET AL.	
	Examiner Ashwin Mehta	Art Unit 1635	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) *3,5,17,19 and 25-40* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,6-16,18 and 20-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

KATRINA TURNER
PATENT ANALYST

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)
16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *6* .
18) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
19) ☐ Notice of Informal Patent Application (PTO-152)
20) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-21 and 24, and the nucleotide sequence encoding SEQ ID NO: 1 wherein Val13 is replaced by Met, in Paper No. 16 is acknowledged. The traversal is on the ground(s) that unity of invention was not found lacking by the PCT administrative authority; the MPEP indicates that unity of invention is to be considered only in relation to independent claims, and the claims of Group II are dependent on claim 20 of Group I. Applicants therefore request reconsideration and rejoinder of Groups I and II (claims 22 and 23). Upon further consideration, and as the DNA fragment of claim 22 encodes SEQ ID NO: 1 wherein Val13 is replaced by Met, the Examiner has decided to rejoin Groups I and II, claims 1-24.

Applicant also traverses the requirement to select a single nucleotide sequence. The traversal is on the grounds that the Examiner has provided no basis for asserting that the specific sequences of the invention are independent and patentably distinct. Applicant also draws attention to the fact that the Commissioner decided *sua sponte* to partially waive 37 C.F.R. 1.475 and 1.499 to permit Applicants to claim up to 10 nucleotide sequences that do not have the same or corresponding special technical feature. This is not found persuasive because searches of more than one sequence per application are placing an undue burden on the automated search capabilities of the Office. The requirement is still deemed proper and is therefore made FINAL. Note that claims 3, 5, 17, and 19 are drawn to non-elected sequences. Therefore, claims 3, 5, 17,

19 are withdrawn, along with claims 25-40, as being drawn to a non-elected invention.

Claims 1, 2, 4, 6-16, 18, and 20-24 are examined in this Office action.

Information Disclosure Statement

2. Applicants are asked to supply copies of the documents listed on the IDS submitted 18 August 1999.

Claim Objections

3. Claims 1, 2, 4, 7-16, 18, 21, and 24 are objected to for encompassing non-elected nucleotide sequences.

4. Claims 7-9 and 21 are objected to for depending from non-elected claims.

5. Claim 8 is objected to because of the following minor informality: the claim is missing a period punctuation mark. Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 15, 16, 18, and 20-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 15, 16, 18, and 20-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 15 reads on a DNA

fragment per se which is found in nature and thus, is unpatentable to applicant. Part (2) of claim 15 states the DNA fragment "can be isolated and detected" (emphasis added), indicating that it has not yet been isolated and detected. Similarly, line 3 of claim 22 indicates the DNA fragment "can be isolated". Part (4) of claim 15 indicates the fragment can confer protoporphyrin (PPO)-inhibiting herbicide resistance when expressed in plant or algal cells. Naturally occurring mutant plants or algae containing the DNA fragment in its genome would have such resistance. The DNA molecule, as claimed, has the same characteristics as those found naturally in a genome and therefore does not constitute patentable subject matter. See American Wood v. Fiber Disintegrating Co., 90 U.S. 566 (1974), American Fruit Growers v. Brodgex Co., 283 U.S. 2 (1931), Funk Brothers Seed Co. v. Kalo Inoculant Co., 33 U.S. 127 (1948), Diamond v. Chakrabarty, 206 USPQ 193 (1980). It is suggested that Applicant use the language "isolated" or "purified" in connection with the DNA fragment to identify a product that is not found in nature.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 20-24 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,160,206. Although the conflicting claims are not identical, they are not patentably distinct from each other because both sets of claims encompass the same DNA molecules. The isolated DNA molecules of claims 1-5 and the plasmid of claim 6 of '206 fall within the genus of DNA fragments and plasmids encompassed by the instant claims.

8. Claims 1, 2, 4, 6-11 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 19-22 of copending Application No. 09/371,507. Although the conflicting claims are not identical, they are not patentably distinct from each other because: The claims of both applications are drawn to a method of conferring resistance to porphyrinogen-oxidase inhibiting herbicides, comprising introducing into plant cells a DNA fragment comprising a sequence encoding protein or part that has PPO activity and confers resistance to PPO-inhibiting herbicides. The claims of '507 are drawn to a particular fragment obtained from *Chlamydomonas*. The claims of the instant application are not patentably distinct from those of '507 because they encompass the genus of DNA fragments that encode the same properties as the DNA of the claims of '507. More particularly instant claims 6-9 encompass the very same DNA fragments isolated from *Chlamydomonas*, which encompasses the DNA fragments of the claims of '507. The DNA of the claims of '507

have the same mutation that confers the herbicide resistance property as the DNA of the instant claims.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 1, 2, 4, 7-16, 18, 20-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The recitation "biologically functional equivalent" in claims 1, 2, and 15-24 renders those claims and dependent claims 4 and 7-14 indefinite. The meaning of the recitation is not clear. For example, the recitation can be interpreted to refer to DNA molecules that encode proteins that have no structural relationship to SEQ ID NO: 1, but which still confer resistance to plant cells against PPO-inhibiting herbicides. Or is the recitation referring to a non-DNA molecule, etc.? The recitation makes the metes and bounds of the claims unclear.

Further regarding claims 20-23: The recitation "or biologically functional equivalent thereof" in line 1 of the claims renders them indefinite. Each of the claims places a limitation on the DNA fragment of the claim(s) from which they depend. However, line 1 of each of the claims indicates the claim is also drawn to a biologically functional equivalent of the DNA fragment. It is not clear if the claims are only drawn to

that limitation placed on the DNA fragment, or also to any biological functional equivalent thereof. The metes and bounds of the claims are not clear. For example for claim 21, is the claim only drawn towards DNA fragments that encode the indicated methionine substitution, or does it still encompass any biologically functional equivalent thereof?

10. Claim 1 and dependent claims 2, 4, and 7-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, part (2) contains improper "Markush"-type terminology. Examples of proper Markush terminology, for a hypothetical claim in which an item from a group consisting of A, B, C, and D, is to be chosen, are 1) the chosen item is A, B, C, or D; 2) the chosen item is selected from the group consisting of A, B, C, and D. See MPEP § 2173.05(h). Note, however, that the group in question encompasses non-elected sequences.

11. Claims 1, 2, 4, 7-16, 18, 21, and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The recitations "homologous" and "can be detected or isolated by DNA-DNA or DNA-RNA hybridization methods" in part (2) of claims 1 and 15 render those claims and those dependent thereon indefinite. The recitation "homologous" does not provide any information about the DNA fragment in question without further information concerning

the percent of homology to a reference DNA fragment. Part (2) of claims 1 and 15 also indicates that the homologous DNA fragment can be detected and isolated by hybridization methods. However, no hybridization conditions are provided, and any two DNA molecules can hybridize to each other under the proper conditions. The recitations therefore does not provide any information about the DNA fragment, and it is unclear what DNA fragments are being referred to.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

12. Claims 1, 2, 4, 6-16, 18, and 20-24 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The claims are broadly drawn towards a DNA fragment or biologically functional equivalent thereof, wherein said DNA fragment encodes a protein or part of a protein having protoporphyrinogen oxidase activity in plants, and can be detected and isolated by DNA-DNA or DNA-RNA hybridization to any nucleic acid sequence homologous to a sequence encoding SEQ ID NO: 1, and encodes a protein in which the amino acid corresponding to Val13 of SEQ ID NO: 1 is substituted by another amino acid, and has the ability to confer resistance to protoporphyrinogen-inhibiting herbicides in a plant or algal cells; or wherein said DNA fragment encodes a protein or part thereof having PPO

activity in a dicot; or wherein said plant is a monocot; or wherein said plant is *Chlamydomonas* and the DNA fragment or biological functional equivalent thereof which encodes the amino acid sequence resulting from replacement of Val13 with any other amino acid sequence; or wherein said amino acid is methionine; or said DNA fragment or biological functional equivalent thereof, wherein the DNA fragment is genomic DNA isolated from *Chlamydomonas*, the nucleotide corresponding to G37 in SEQ ID NO: 4 is replace with another nucleotide, and encodes a protein or part thereof having PPO activity; or wherein said nucleotide is adenine; or a plasmid comprising said DNA fragment or biological functional equivalent thereof; or a method of conferring resistance to PPO-inhibiting herbicides upon plants or plant cells, comprising introducing said DNA fragment or biological functional equivalent thereof into plants or plant cells and said DNA fragment has the ability to confer resistance to said herbicides in plant or algal cells when expressed therein; or said method when resistance is conferred to *Chlamydomonas*; or plant or plant cells or green alga upon which resistance is conferred according to said method; a method of selecting plant or algal cells upon which resistance is conferred according to said method; a method of controlling cells lacking resistance to PPO-inhibiting herbicides, comprising cultivated fields of plants produced according to said method of conferring resistance.

Pages 39-51, Examples 5 and 7, of the specification describes the isolation of a genomic clone, COS-2955, of a mutant PPO gene from a *Chlamydomonas* strain that is resistant to PPO-inhibiting herbicides (pages 39-51, Examples 5 and 7, page 53, Example 9). Complementation assays conducted with restriction fragments from this clone determined that a HindIII fragment (Hind10.0) conferred PPO-herbicide resistance to a

herbicide-sensitive *Chlamydomonas* strain (Example 7). Further analysis revealed that a Xho-PmaCI fragment (Xho/PmaC2.6, SEQ ID NO: 10) within the Hind10.0 fragment was the smallest fragment to complement the herbicide-sensitive strain. The exon domains within the Xho/PmaC2.6 fragment were determined based on comparison to the *Arabidopsis* Protox (an acronym for protoporphyrin oxidase) cDNA clone (page 55). Comparison of the exon sequences with the corresponding sequences from the wild-type *Chlamydomonas* clone revealed a base change in exon 1 (page 56). SEQ ID NO: 4 is the base sequence of this exon in the wild-type clone (and encodes SEQ ID NO: 1). In the PPO-inhibiting herbicide resistant mutant, guanine 37 of this exon is changed to adenine. This results in a change of Val 13 of SEQ ID NO: 1 to Met (pages 55-57, Example 11).

Though the Xho/PmaC2.6 fragment conferred herbicide resistance to a herbicide sensitive *Chlamydomonas* strain, it does not contain the entire gene. Randolph-Anderson et al. describe the isolation of the clones described in the instant specification, and the isolation of a cDNA that contains the full-length coding region of the *Chlamydomonas* PPO gene (Plant Mol. Biol., 1998, Vol. 38, pages 848-851). Randolph-Anderson indicate that the guanine to adenine base change occurs in exon 10 of the full length clone, corresponding to a change of Val 389 to Met of the encoded protein (page 851).

Though the specification does not provide the nucleotide sequence of the full length genomic clone of the *Chlamydomonas* mutant PPO gene, it describes the isolation of a DNA fragment, Hind10.0, which contains the genomic clone. The specification also describes a DNA fragment, Xho/PmaC2.6, which encodes a portion of the PPO gene, but which is also sufficient to confer PPO-inhibiting herbicide resistance when introduced into a herbicide-sensitive *Chlamydomonas* strain. However, the specification does not

describe any PPO functional activity encoded by the Xho/PmaC2.6 fragment itself. As it does not encode the full protein, the structure of this portion of the PPO gene does not correlate with the normal wild-type PPO function. The specification therefore does not describe any DNA fragments that encode a part of a protein having PPO activity, as claimed. Further, sequences which hybridize to sequences homologous to those encoding SEQ ID NO: 1, or which encode SEQ ID NO: 1 wherein the amino acid corresponding to Val13 of SEQ ID NO: 1 is converted to Met, or biological functional equivalents thereof, are not described and reduced to practice. As the amino acid sequence of the full length *Chlamydomonas* PPO protein is not described, one cannot determine the amino acid of the protein encoded by any such hybridizing sequence which corresponds to Val 13 of SEQ ID NO: 1. No other structural changes to SEQ ID NO: 1 are correlated to the functional property of conferring PPO-herbicide resistance, while still retaining PPO activity. Also see Fiers vs. Sugarno, 25 USPQ 2d (CAFC 1993) at 1606, which states that "[a]n adequate written description of a DNA requires more than a mere statement that it is part of the invention and reference to a potential method for isolating it; what is required is a description of the DNA itself". Given the breadth of the claims encompassing any DNA fragment encoding a portion of a protein having PPO activity, and sequences which hybridize to sequences with any homology to sequences encoding SEQ ID NO: 1, and which encode any protein in which a valine residue corresponding to Val13 of SEQ ID NO: 1 is changed to another amino acid, and the lack of written description as discussed above, the specification fails to provide an adequate written description of the multitude of DNA fragments encompassed by the claims.

13. Claims 1, 2, 4, 6-16, 18, and 20-24 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the Hind10.0 fragment from Cos2955, does not reasonably provide enablement for any DNA fragment of encoding a part of the protein having PPO activity in plants. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

The subject of the claims are listed above.

The specification teaches the isolation of a genomic clone from *Chlamydomonas* that encodes a mutant PPO protein that confers resistance to PPO-inhibiting herbicides while still retaining PPO function, as discussed above. The specification also teaches a DNA fragment, Xho/PmaC2.6, of the clone which also confers herbicide resistance to herbicide sensitive *Chlamydomonas* strains, also as discussed above. However, Xho/PmaC2.6 contains only a portion of the mutant gene, and does not encode the full protein (see the discussion and Randolph-Anderson, above). U.S. Patent No. 6,160,206 teaches the isolation of the same clone from the same *Chlamydomonas* strain, and indicates that a 3.4kb fragment, from which Xho/Pmac2.6 was derived, contains only a portion of the resistant gene and must integrate into the herbicide-sensitive gene when introduced into a *Chlamydomonas* recipient by homologous recombination, to be expressed (col. 15, lines 29-34). It is unpredictable that this DNA fragment alone encodes a protein with PPO activity. It is unlikely that is has PPO activity, given that Randolph-Anderson teach that the full length genomic clone contains 14 exons (see figure 2), whereas the incomplete clone of the Xho/PmaC2.6 fragment only contains 5 exons (page 56). Undue experimentation would be required by one skilled in the art to

determine if this DNA fragment encodes PPO activity, as the only guidance provided by the specification for this purpose is to introduce the fragment into other *Chlamydomonas* strains. Given the breadth of the claims encompassing DNA fragments encoding parts of PPO proteins that have PPO activity, unpredictability of the art and lack of guidance of the specification as discussed above, undue experimentation would be required by one skilled in the art to make and use the claimed invention.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14. Claims 1, 2, 10, 11, 12-16, and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Ward et al.

The claims are broadly drawn towards a DNA fragment or biologically functional equivalent thereof, wherein said DNA fragment encodes a protein or part of a protein having protoporphyrinogen oxidase activity in plants, and can be detected and isolated by DNA-DNA or DNA-RNA hybridization to any nucleic acid sequence homologous to a sequence encoding SEQ ID NO: 1, and encodes a protein in which the amino acid corresponding to Val13 of SEQ ID NO: 1 is substituted by another amino acid, and has the ability to confer resistance to protoporphyrinogen-inhibiting herbicides in a plant or algal cells; or wherein said DNA fragment encodes a protein or part thereof having PPO

activity in a dicot; or a plasmid comprising said DNA fragment or biological functional equivalent thereof.

Ward et al. teach plant protox (PPO) herbicide resistant mutant genes that differ from the herbicide-sensitive wild-type in that they have single base changes (pages 63-66, Examples 24 and 25). As the herbicide-resistant enzyme encoded by the mutants still retain PPO function, these mutant genes can be considered biological functional equivalents of DNA fragments which encode PPO proteins in which the amino acid corresponding to Val13 of SEQ ID NO: 1 is changed to another amino acid and confers resistance to PPO-inhibiting herbicides. Ward et al. also teach a method to produce herbicide tolerant plants comprising introducing expression plasmids comprising the resistant mutants into *Arabidopsis* plants. The transformants are selected by plating on media comprising PPO-inhibiting herbicide and scoring for germination and survival (page 67), and that the mutants can be used as selectable markers in transformation methods (page 10). Ward et al also teach that the plants with altered protox activity can be used in a method to control the growth of undesired vegetation in a population (page 8), and teach numerous herbicides that can be used, which include formulas 5 and 16 of claim 13 and formula 21 of claim 14.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

15. Claims 1, 2, 4, 10-16, 18, and 20-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ward et al in combination with Purton et al.

The claims are broadly drawn towards a DNA fragment or biologically functional eqivalent thereof, wherein said DNA fragment encodes a protein or part of a protein having protoporphyrinogen oxidase activity in plants, and can be detected and isolated by DNA-DNA or DNA-RNA hybridization to any nucleic acid sequence homologous to a sequence encoding SEQ ID NO: 1, and encodes a protein in which the amino acid corresponding to Val13 of SEQ ID NO: 1 is substituted by another amino acid, and has the ability to confer resistance to protoporphyrinogen-inhibiting herbicides in a plant or algal cells; or wherein said DNA fragment encodes a protein or part thereof having PPO activity in a dicot; or wherein said plant is a monocot; or wherein said plant is *Chlamydomonas* and the DNA fragment or biological functional equivalent thereof which encodes the amino acid sequence resulting from replacement of Val13 with any other amino acid sequence; or wherein said amino acid is methionine; or said DNA fragment or biological functional equivalent thereof, wherein the DNA fragment is genomic DNA isolated from *Chlamydomonas*, the nucleotide corresponding to G37 in SEQ ID NO: 4 is replaced with another nucleotide, and encodes a protein or part thereof having PPO activity; or wherein said nucleotide is adenine; or a plasmid comprising said DNA fragment or biological functional equivalent thereof; or a method of conferring resistance to PPO-inhibiting herbicides upon plants or plant cells, comprising introducing said DNA fragment or biological functional equivalent thereof into plants or plant cells and said DNA fragment has the ability to confer resistance to said herbicides in plant or algal cells when expressed therein; or said method when resistance is conferred to *Chlamydomonas*;

or plant or plant cells or green alga upon which resistance is conferred according to said method; a method of selecting plant or algal cells upon which resistance is conferred according to said method; a method of controlling cells lacking resistance to PPO-inhibiting herbicides, comprising cultivated fields of plants produced according to said method of conferring resistance.

Ward et al teach transgenic PPO-herbicide resistant *Arabidopsis* plants expressing a mutant PPO gene that confers resistance to PPO-herbicides while retaining PPO function, as described above. Ward also teaches a method to transform monocots (pages 61-63) and that the use of herbicides to control the undesirable vegetation such as weeds or plants in crops has become universal practice (page 3). Ward also teaches the formulae of numerous PPO-inhibiting herbicides (pages 16-21), and that the resistant mutants can be used as selectable markers (page 10).

Ward et al do not teach monocots or *Chlamydomonas* transformed with the mutant genes.

Purton et al teach stable transformation of *Chlamydomonas* (pages 533-536).

It would have been obvious and within the scope of one of ordinary skill in the art at the time the invention was made to modify the method of conferring PPO-inhibiting herbicide resistance to *Arabidopsis* of Ward et al by introducing the mutant PPO-inhibiting herbicide resistance genes into monocot plants. One would also be motivated to introduce the resistance mutants into dicot and monocot crop plants, so that the growth of plants lacking resistance to PPO-inhibiting herbicides can be controlled, given the assertion of Ward et al that the use of herbicides to control undesirable vegetation is a universal practice. It is obvious to modify the method of Ward et al by introducing the

resistance mutants into any plant, including the algae *Chlamydomonas*, using the transformation method of Purton et al, for example. One would obviously be motivated to confer herbicide resistance to any desirable plant, as they can be used as selectable markers in transformation methods, as taught by Ward et al. Ward et al also teach numerous PPO-inhibiting herbicides, including Formula XVII, which, in claim 13, is formula 5 and 16, and formula 21 of claim 14.

16. No claim is allowed.

CONCLUDING REMARKS

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ashwin Mehta whose telephone number is 703-306-4540. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays from 8:30 A.M. to 5:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paula Hutzell can be reached on 703-308-4310. The fax phone number for the organization where this application or proceeding is assigned is 703-305-3014.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0196.

Amy Nelson

AMY J. NELSON, PH.D
PRIMARY EXAMINER

Ashwin Mehta
August 13, 2001